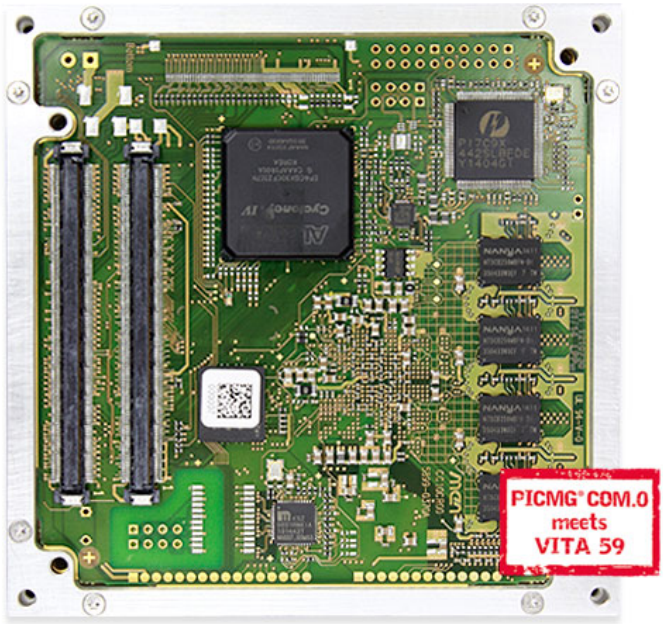
CC10C – Rugged COM Express® (VITA 59 RCE) with ARM® i.MX 6

- **Freescale™ ARM® i.MX 6 Series**
- **Quad-core processor**
- **Comprehensive usage of i.MX 6 I/O**
- **Configurable FPGA I/O with 140 pins**
- **Maximum flexibility in interface configuration**
- **Up to 4 GB DDR3 SDRAM**
- **eMMC multimedia card**
- **U-Boot Universal Boot Loader**
- **-40°C to +85°C Tcase guaranteed with qualified components**
- **Conduction cooling**
- **VITA 59 in process, compliant with COM Express® Compact, type 6**
- **PICMG COM.0 COM Express® version also available**



The CC10C is a Rugged COM Express® module (RCE) built around the Freescale™ ARM® i.MX 6 series of processors with a Cortex®-A9 architecture. Supporting different types of the i.MX 6Solo, 6DualLite, 6Dual and 6Quad families, the computer-on-module is widely scalable, e.g., to processing or graphics requirements. Where less performance is needed, you can optimize costs by choosing a single- or dual-core processor instead of a quad core.

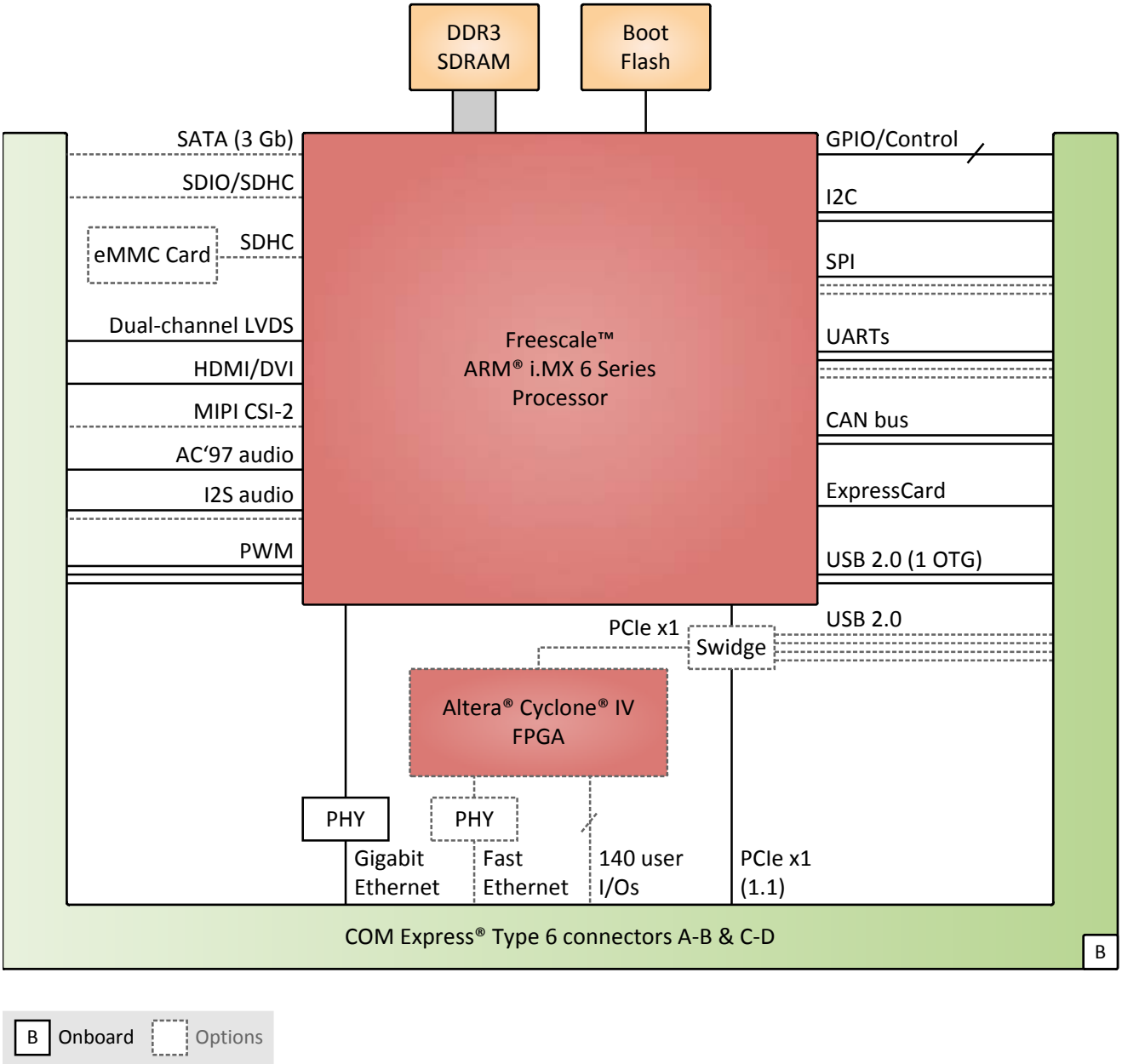
Rugged COM Express® modules are 100% compatible to COM Express® but conform to the new VITA 59 standard (in process) which specifies the mechanics to make COM Express® modules suitable for operation in harsh environments. The CC10C is based on the "Compact", 95 x 95 mm form factor and Type 6 connector pin-out, and can even be semi-customized to become a standard COM Express® module, without much additional design effort.
With RCE-compliant mechanics for conduction cooling, the module's size extends to 105 x 105 mm. It is embedded in a covered frame ensuring EMC protection and allowing efficient conductive cooling. Air cooling is also possible by applying a heat sink on top of the cover. Its optimized mechanics let the CC10C support an extended operating temperature range of -40 to +85°C.

The exclusive use of soldered components ensures that the COM withstands shock and vibration. The design is optimized for conformal coating.

Adding to its rugged design, the computer-on-module's range of supported functions leave almost nothing to wish for. With a maximum of 4 GB DDR3 RAM and an onboard eMMC device, the CC10C covers all basic memory needs. 3-Gbit SATA is provided for external mass storage.
One of the biggest strengths of the CC10C lies in its I/O flexibility. The i.MX 6 provides an abundance of onchip controllers and interfaces, including Gigabit Ethernet, USB 2.0 (also with OTG/client support) and PCI Express®. Different video outputs like LVDS and HDMI/DVI, audio and an optional camera interface make the card fit for multimedia applications. Other serial ports provide UARTs or CAN bus.
Where the processor's standard functions are not a perfect match, an onboard FPGA opens up 140 signal pins for user I/O. As IP cores are easy to integrate, the CC10C becomes a semi-custom solution with the suitable functionality even for more specialized applications.
The resulting I/O functionality in the ordered version depends on the customer's requirements and will always be a tailored combination of i.MX 6 and FPGA-based I/O, without the need for a completely new design.

For evaluation and development purposes a microATX carrier board, the XC15, is available.

Diagram


DDR3 SDRAM
Boot Flash
SATA (3 Gb)
SDIO/SDHC
eMMC Card
SDHC
Dual-channel LVDS
HDMI/DVI
MIPI CSI-2
AC'97 audio
I2S audio
PWM
Freescale™ ARM® i.MX 6 Series Processor
GPIO/Control
I2C
SPI
UARTs
CAN bus
ExpressCard
USB 2.0 (1 OTG)
USB 2.0
PCIe x1
Swidge
Altera® Cyclone® IV FPGA
PHY
PHY
Gigabit Ethernet
Fast Ethernet
140 user I/Os
PCIe x1 (1.1)
COM Express® Type 6 connectors A-B & C-D
B
B Onboard
Options

Technical Data

CPU	■ Freescale™ ARM® i.MX 6 Series (ARM® Cortex®-A9 architecture) ■ The following CPU types are available: □ i.MX6S (i.MX 6Solo family) □ i.MX6DL (i.MX 6DualLite family) □ i.MX6D (i.MX 6Dual family) □ i.MX6Q (i.MX 6Quad family) ■ See overview of supported processor types for processor options and a feature matrix of the i.MX 6 series.
Memory	■ System Memory □ Soldered DDR3 □ 1 GB, 2 GB, or 4 GB ■ Boot Flash □ 4 MB, 8 MB, or 16 MB
Mass Storage	■ The following mass storage devices can be assembled: □ eMMC device, soldered; different sizes available
Graphics	■ Integrated in i.MX 6 processor ■ Multi-stream-capable HD video engine delivering up to 1080p60 decode, 1080p30 encode and 3D video playback in HD ■ Maximum resolution: 1920 x 1200 pixels (WUXGA) ■ Superior 3D graphics performance with up to four shaders performing 200 Mt/s and OpenCL™ support ■ Separate 2D and/or OpenVG Vertex acceleration engines for optimal user interface experience ■ Stereoscopic image sensor support for 3D imaging

Technical Data

Onboard Interfaces	■ Available via COM Express® connectors ■ Video □ One HDMI/DVI interface □ One LVDS interface, dual-channel □ One MIPI CSI-2 camera serial host interface; optional ■ Audio □ One AC'97 audio interface □ One I2S audio interface ■ SATA □ One channel, SATA Revision 2.x (3 Gbit/s); only with i.MX6D or i.MX6Q ■ SDIO/SDHC □ One channel for MMC/SD/SDIO cards ■ USB □ Two host channels, USB 2.0 (480 Mbit/s), or □ Six host channels, USB 2.0 (480 Mbit/s) □ One channel always implemented as OTG (On-The-Go) host/client channel ■ Ethernet □ One channel, 1000BASE-T (1 Gbit/s) □ One channel, 100BASE-T (100 Mbit/s); optional □ Two link and activity LED signals per channel ■ PCI Express® □ One x1 link (250 MB/s per link), PCIe® 1.1 (2.5 Gbit/s per lane) ■ ExpressCard® □ One interface ■ CAN bus □ Two CAN bus channels, 2.0B CAN protocol, 1 Mbit/s □ Two additional CAN bus channels, 2.0A/B CAN protocol, 1 Mbit/s; with FPGA; optional □ External transceivers to be implemented on carrier board ■ UART □ Up to six interfaces, up to 4 Mbit/s □ Physical interfaces RS232 or RS422/RS485 depending on interface controller and implementation on carrier board ■ PWM □ Three PWM interfaces ■ I2C □ Up to four I2C interfaces ■ SPI □ Up to three SPI interfaces ■ COM Express® control signals □ Four COM Express® control signals ■ GPIO □ 9 GPIO lines, 4 GPO lines, 3 GPI lines □ 64 GPIO lines, with FPGA; optional
FPGA	■ No FPGA assembled, with custom configuration of i.MX 6 I/O interfaces, or ■ FPGA Altera® Cyclone® IV, with custom IP core and i.MX 6 I/O configuration □ Total available pin count: 140 pins on COM Express® connectors ■ The IP cores that make sense and/or can be implemented depend on the board model, available pin counts and number of logic elements. Please contact MEN for information on feasibility.
Supervision and Control	■ Power supervision and watchdog ■ Temperature measurement □ i.MX 6 temperature measurement □ Additional onboard temperature sensor; optional ■ Real-time clock, with supercapacitor or battery backup on the carrier board

Technical Data

Computer-On-Module Standard	■ CC10C: VITA 59 RCE: Rugged COM Express® in process □ With conduction cooling cover and frame □ Rugged COM Express® Compact, Module Pin-out Type 6 ■ CC10: PICMG COM.0 COM Express® Module Base Specification □ COM Express® Compact, Module Pin-out Type 6
Electrical Specifications	■ Supply voltage □ +12 V (9 to 16 V) ■ Power consumption □ 12 W, measured in stress test using 15CC10C00, i.MX6Q quad-core @ 1.0 GHz □ 7.4 W, measured in test (activity on Gb Ethernet and 1 USB interface) using 15CC10C00, i.MX6Q quad-core @ 1.0 GHz □ 5 W, measured in test (activity on Gb Ethernet and 1 USB interface) using 15CC10-00, i.MX6S single-core @ 800 MHz
Mechanical Specifications	■ Dimensions □ 105 mm x 105 mm x 18 mm (models conforming to VITA 59 RCE Compact format, PCB mounted between a cover and a frame) □ 95 mm x 95 mm (models conforming to PICMG COM.0 COM Express® Compact format) ■ Weight □ 356 g (model 15CC10C00) □ 40 g (model 15CC10-00)
Environmental Specifications	■ Temperature range (operation) □ -40°C to +85°C Tcase (VITA 59 cover/frame) (qualified components) (model 15CC10C00) □ -40°C to +85°C (qualified components) (model 15CC10-00) ■ Temperature range (storage): -40°C to +85°C ■ Cooling concept □ Conduction-cooled (models conforming to VITA 59 RCE Compact format, PCB mounted between a cover and a frame) □ Air-cooled (models conforming to PICMG COM.0 COM Express® Compact format) ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300 m to +3000 m ■ Shock: 50 m/s², 30 ms (EN 61373) ■ Vibration (function): 1 m/s², 5 Hz to 150 Hz (EN 61373) ■ Vibration (lifetime): 7.9 m/s², 5 Hz to 150 Hz (EN 61373) ■ Conformal coating; optional
Reliability	■ MTBF □ 652 986 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 15CC10C00) □ 1 233 470 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 15CC10-00)
Safety	■ Flammability □ UL 94V-0
EMC	■ EMC behavior generally depends on the system and housing surrounding the COM module. ■ The Rugged COM Express® module in its cover and frame supports the system to meet the requirements of □ EN 55022 (radio disturbance) □ IEC 61000-4-2 (ESD) □ IEC 61000-4-3 (electromagnetic field immunity) □ IEC 61000-4-4 (burst) □ IEC 61000-4-5 (surge) □ IEC 61000-4-6 (conducted disturbances)
Software Support	■ Linux (in preparation) ■ VxWorks® (in preparation) ■ For more information on supported operating system versions and drivers see Downloads.

Technical Data

BIOS	■ U-Boot Universal Boot Loader

Configuration & Options

Standard Configurations

Article No.	CPU	Memory	Storage	Multimedia	I/O	FPGA	Temperature	Standard Compliance
15CC10C00	i.MX6Q, 1 GHz	2 GB RAM, 4 MB Flash	1 SATA, 4 GB eMMC	LVDS, HDMI/ DVI, AC'97, I2S	6 USB, Gb ETH, Fast ETH, UARTs, CAN, GPIO, PWM, I2C, SPI	Yes	-40..+85°C Tcase	VITA 59 RCE
15CC10-00	i.MX6S, 800 MHz	1 GB RAM, 4 MB Flash	4 GB eMMC	LVDS, HDMI/ DVI, MIPI CSI, AC'97, I2S	2 USB, Gb ETH, UARTs, CAN, GPIO, PWM, I2C, SPI	No	-40..+85°C	PICMG COM.0

Ordering Information

Standard CC10C Models	**15CC10-00**	COM Express® "Compact", type 6, Freescale™ i.MX6S, 0.8 GHz, 1 GB RAM, 4 GB eMMC, 2 USB, 1 Gb ETH, no FPGA, -40..+85°C with qualified components; without VITA 59 conduction cooling frame
	15CC10C00	Rugged COM Express® "Compact", type 6, Freescale™ i.MX6Q, 1 GHz, 2 GB RAM, 4 GB eMMC, 6 USB, 1 Gb Ethernet, 1 Fast Ethernet, PCIe® 1.1, with FPGA, -40..+85°C Tcase with qualified components; with VITA 59 conduction cooling frame
Related Hardware	**08XC15-00**	XC15, evaluation and development board for COM Express® and Rugged COM Express® (VITA-59) modules
Miscellaneous Accessories	**05CC10-00**	Heat spreader for COM Express® CC10 and display controller CC10S
Software: Linux	This product is designed to work under Linux. See below for all available separate software packages.	
	13MD05-90	MDIS5 System (and Device Driver) Package (MEN) for Linux. This software package includes most standard device drivers available from MEN.
	13Z016-06	MDIS5 driver (MEN) for 16Z029_CAN (CANopen master)
	13Z100-91	Linux FPGA update tool (MEN)
Software: VxWorks®	This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.	
	13MD05-60	MDIS5 System Package (MEN) for VxWorks®
	13Z015-06	MDIS5 low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)
	13Z016-06	MDIS5 driver (MEN) for 16Z029_CAN (CANopen master)
	13Z017-06	MDIS5 low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO
	13Z025-60	VxWorks® native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART
	13Z100-60	VxWorks® FPGA update tool (MEN)

For operating systems not mentioned here contact MEN sales.

Documentation	Compare Chart Computer-On-Modules » Download	
	You can find the official COM Express® Carrier Design Guide directly on www.picmg.org.	
	20CC10C00	CC10C/CC10 User Manual

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